

April 16, 2018

The Board of Commissioners of Public Utilities  
Prince Charles Building  
120 Torbay Road, P.O. Box 21040  
St. John's, NL  
A1A 5B2 Canada

**Attention: Ms. Cheryl Blundon**  
**Director Corporate Services & Board Secretary**

Dear Ms. Blundon:

**Re: Newfoundland and Labrador Hydro – 2018 Capital Budget Application – Response to item 1 pursuant to Board Order P.U. 9(2018) Re: Muskrat Falls to Happy Valley Interconnection Project**

The enclosed is in response to P.U. 9(2018), which states “Hydro shall file on or before April 16, 2018 a proposed plan in relation to the provision of reliable service in Labrador East in 2018/2019.”

The Labrador East system is an aged system as it currently exists. Service to Labrador East is provided by the 138 kV transmission line (L1301/L1302), which is a radial transmission system from Churchill Falls constructed in 1976, and a gas turbine/synchronous condenser package at the Happy Valley Terminal Station commissioned in 1992. The system is challenged by growing demand, infrastructure reliability, and location conditions (i.e. weather and remoteness).

### **Existing System Risks**

#### **1. Growing Load Forecast**

The load forecast continues to grow in Labrador East primarily due to data centre growth. The current system capacity is 77 MW and the 2018/2019 winter P50 forecast is 80.6 MW, which is 3.6 MW above the available system capacity. The P90 load forecast is approximately 4 MW higher than the P50 forecast. To manage this demand and provide reliable service to customers, load curtailment or additional capacity is required.

Hydro is currently working on a plan to address increased demand related to data centre applications, in particular data mining centres. Acceptance of requests and their in-service dates are subject to capacity availability.

## 2. Infrastructure Reliability

The Labrador East system is an aged system with limited capacity for expansion given its current configuration. All components of the system are required to be in service to provide reliable power. Regular preventative maintenance is completed to maintain the existing assets; however, the system continues to be challenged by the age and condition of these assets.

### a. North Plant

This plant has 5 MW of standby diesel generation; however, the units are beyond life expectancy and are not considered to be a reliable source of capacity and energy for this coming winter.

### b. L1301 Reliability

L1301 is a 42-year old, 269 km transmission line. The line is of substandard construction for a transmission line<sup>1</sup> and has had a considerable impact on customer reliability. The line has known crossarm issues and has been maintained through the Wood Pole Line Management (WPLM) program<sup>2</sup>. Since 2015, of the 1,390 crossarms on the line, 12 failed and were replaced, and a further 31 have been reinforced with steel bracing. Bi-annual helicopter patrols are maintained for this line. The crossarm issue increases potential for transmission failure under heavy load conditions.

### c. Synchronous Condenser Reliability

The operation of the gas turbine as a synchronous condenser is required for voltage support in order to serve peak load and was part of the rationale for its original installation. The maximum load that can be served without the synchronous condenser is 63 MW, which is below current peak, and is 77 MW with the synchronous condenser online.

In the event of a failure of the gas turbine, rotating outages<sup>3</sup> would be required throughout the winter season until such time as the unit could be repaired and put back in service. If there is a failure of the gas turbine, it will prevent the unit from operating as a synchronous condenser and the Labrador East system will be limited to 63 MW.<sup>4</sup> Analysis of the historical hourly data adjusted for the forecasted peak indicates that in the event of gas turbine failure, and no synchronous condenser capability, there would be approximately 35 to 40 days throughout the winter season where the load exceeds 63 MW, with the majority of this time from January to mid-February. The system would have more than 600 hours above this limit, with each day exceeding 63 MW triggering

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<sup>1</sup> L1301 from Churchill Falls to Gull Island was built as a construction power line and is not built to standards that allow for inspection of the crossarm area when the line is energized.

<sup>2</sup> Please refer to Hydro's 2018 Capital Budget Application, Volume 2, Tab 13, Appendix A.

<sup>3</sup> Hydro is currently not set up to perform automatic rotating outages and requires manual operation of its distribution equipment.

<sup>4</sup> Please refer to Hydro's response to RFI PUB-NLH-049.

the necessity of customer outages or curtailed load. During this time, extended or rotating outages would be required until the load dropped substantially below 63 MW to allow for cold load pickup on the transmission line.

**d. Churchill Falls Switchyard Assets**

Additional transformers are required to meet the System Planning Criteria for transformer backup.<sup>5</sup> Failure of the Churchill Falls 125 MVA transformer reduces capacity to 62 MW,<sup>6</sup> with similar rotating outage numbers stated above for failure of the gas turbine and synchronous condenser. This transformer is relatively new; however, in the event of failure, replacement of this unit with an on-site spare would require multiple weeks.

In addition, terminal station flexibility in Churchill Falls is very limited and necessitates outages for CF(L)Co work. This has required both planned and forced outages to customers in Happy Valley-Goose Bay annually, which impacts overall reliability, particularly in the winter when load is forecast to be higher than local generation can manage.

**3. Location Conditions**

Severe winter weather conditions and the remote nature of Labrador East provide additional system risks. Failure of the L1301 line due to wind, ice, or a combination thereof will result in service needing to be provided by the gas turbine and North Plant diesels. Loading and unloading of the gas turbine must be completed gradually due to cold load pickup and block loading limitations, making feeder outage rotation impractical. The existing North Plant diesels have reliability concerns due to their age, as previously stated. The gas turbine and diesels are rated for approximately one-third of the required capacity. Therefore, line failure has potential for a widespread outage in Labrador East for the time it will take to repair the transmission line, which depends on the extent of failure.

L1301 is also susceptible to lightning-initiated outages as it has no overhead ground wire. This has the potential to expose customers to sporadic outages. There are no cost-effective mitigation options against lightning trips on L1301/L1302.

Hydro recognizes that the stated risks to reliability to the Labrador East system are not new and continues to perform all required preventive and corrective maintenance to maintain operational reliability. Hydro maintains the previously proposed Muskrat Falls to Happy Valley Interconnection Project can address most of the system's reliability issues and provide enhanced service for customers; however, it also respects the Board's decision on that

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<sup>5</sup> Please refer to the 2018 Capital Budget Application, Volume 2, Tab 13, Appendix A, Page 11.

<sup>6</sup> This scenario utilizes the existing hot standby transformer in Churchill Falls and continuous running of the gas turbine generation.